Recovering the endangered Moapa Dace (*Moapa coriacea*)

David J. Syzdek — Environmental Biologist

SOUTHERN NEVADA WATER AUTHORITY®

White River Flow System

- Eastern Nevada is drained by a small and discontinuous 200 mile long river
- Flowed during the Pleistocene but now mostly dry with subsurface flow
- Several aquatic endemic species are found in remnant springs, streams, and lakes
- The Muddy River begins at Warm Springs and flows into Lake Mead

Warm Springs Natural Area

- Purchased in 2007 by SNWA, funded by the Southern Nevada Public Land Management Act (SNPLMA) Parks, Trails and Natural Areas Program.
- WSNA acquired to protect and recover the Moapa dace whose habitat is tied to the regional carbonate springs
- Stewardship Plan guides property management and lays out SNWA's commitments
- WSNA is1,220 acres
- Will be open in the future for limited public access

Aquatic Species of Concern in the Warm Springs Area

- Endemics
  - Moapa dace (*Moapa coriacea*)
  - Moapa White River springfish (*Crenichthys baileyi moapae*)
  - Moapa naucorid (*Limnocoris moapensis*)
  - Moapa riffle beetle (*Microcylloepus moapus*)
  - Moapa Warm Springs riffle beetle (*Stenelmis moapa*)
  - Moapa pebblesnail (*Pyrgulopsis avernalis*)

- Rare non-endemics
  - Moapa Valley pyrg (*Pyrgulopsis carinifera*)
  - Grated tryonia (*Tryonia clathrata*)
  - Western naucorid (*Ambrysus mormon*)
  - Pahranagat naucorid (*Pelocoris biimpressus shoshone*)

The Moapa dace (*Moapa coriacea*)

- Cyprinidae family
- Only species in the genus *Moapa*
- Officially described in 1948; but was known before then and was considered “common” in 1933
- Occurred in spring pools, outflow streams, and main river
- Typically found in swift, warm (27°C to 32°C) water
- Small (~3½ inches long)
- Small scales, leathery
- Dark spot on tail

Moapa Dace Recovery Goals
(US Fish and Wildlife)

1. 6,000 adult Moapa dace are present in the five spring systems and the Upper Muddy River for 5 consecutive years.
2. Ensure instream flows and historical habitat in 3 of the 5 spring systems have been protected.
3. 75% of historical habitat in the five spring systems and the Upper Muddy River provide Moapa dace spawning, nursery, cover and/or foraging habitat.
4. Moapa dace population is comprised of 3 or more age classes and reproduction and recruitment is documented from 3 of the 5 spring systems.
5. Nonnative fish and parasites no longer adversely affect the long-term survival of Moapa dace.

Threats to the Moapa Dace

- Invasive species
  - California palms (*Washingtonia filifera)*
  - Western mosquitofish (*Gambusia affinis*) introduced before 1938
  - Shortfin mollies (*Poecilia mexicana*) introduced 1963
  - Blue tilapia (*Oreochromis aureus*) introduced about 1995

Threats to the Moapa Dace

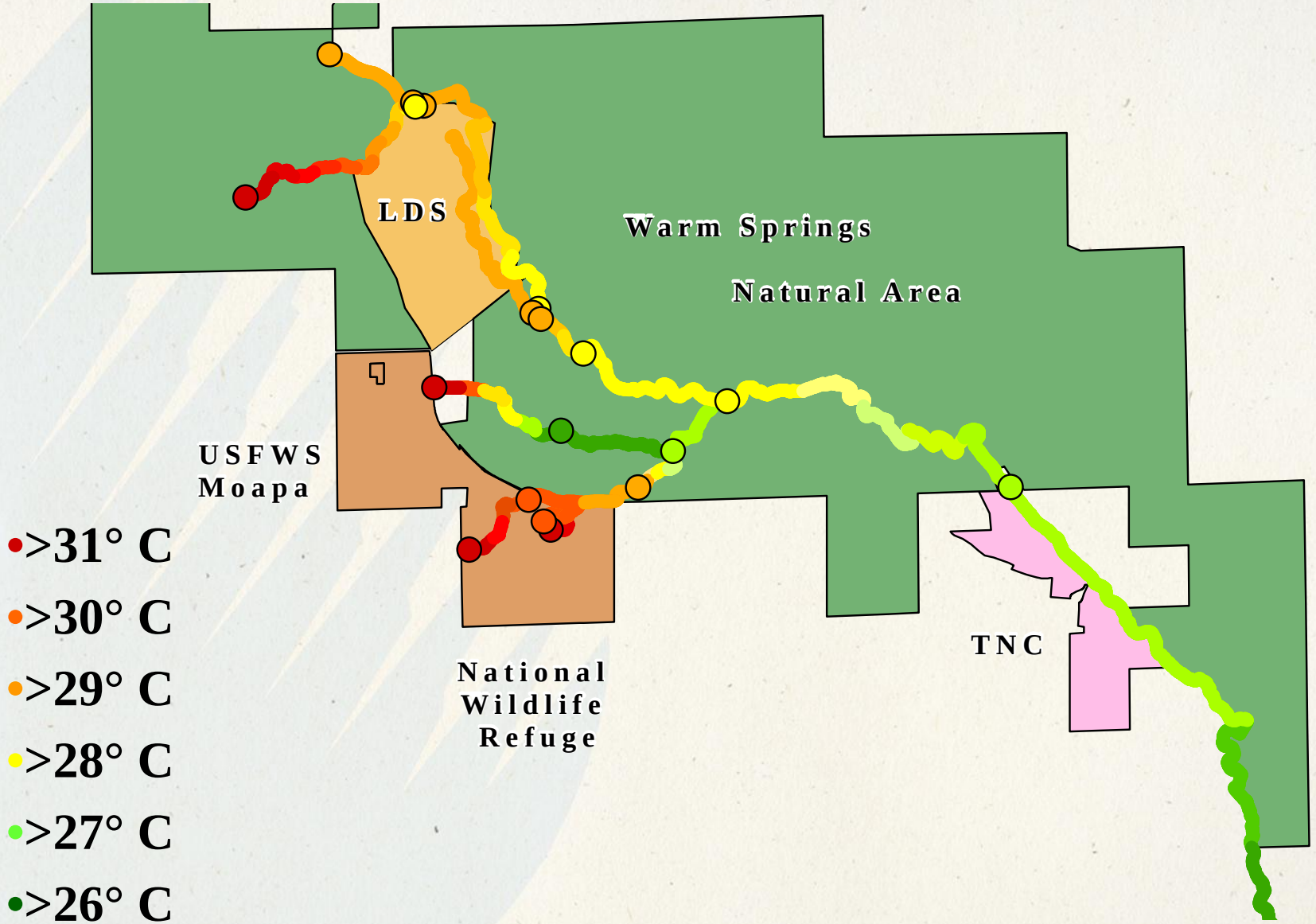
- Irrigation diversions
  - Barriers to movement
  - Fish entrainment
- Recreation Development
  - Springs developed for swimming
  - Pool chlorination
- Groundwater development

Threats to the Moapa Dace

Habitat changes

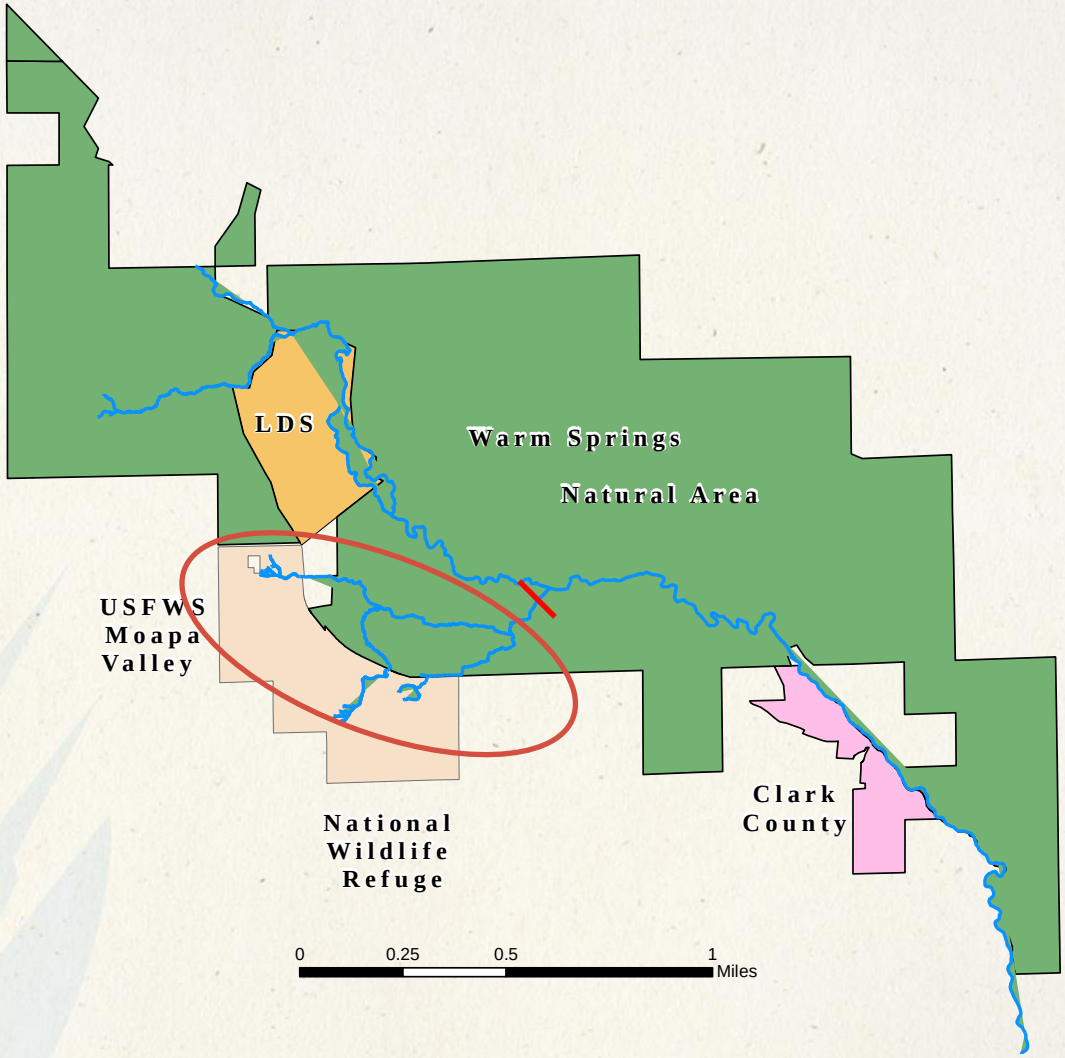
- Entrenchment and headcutting
- Thermal temperatures cooling - due to ponding, sheetflow, and coldwater inflows

Thermal Problems (2008)

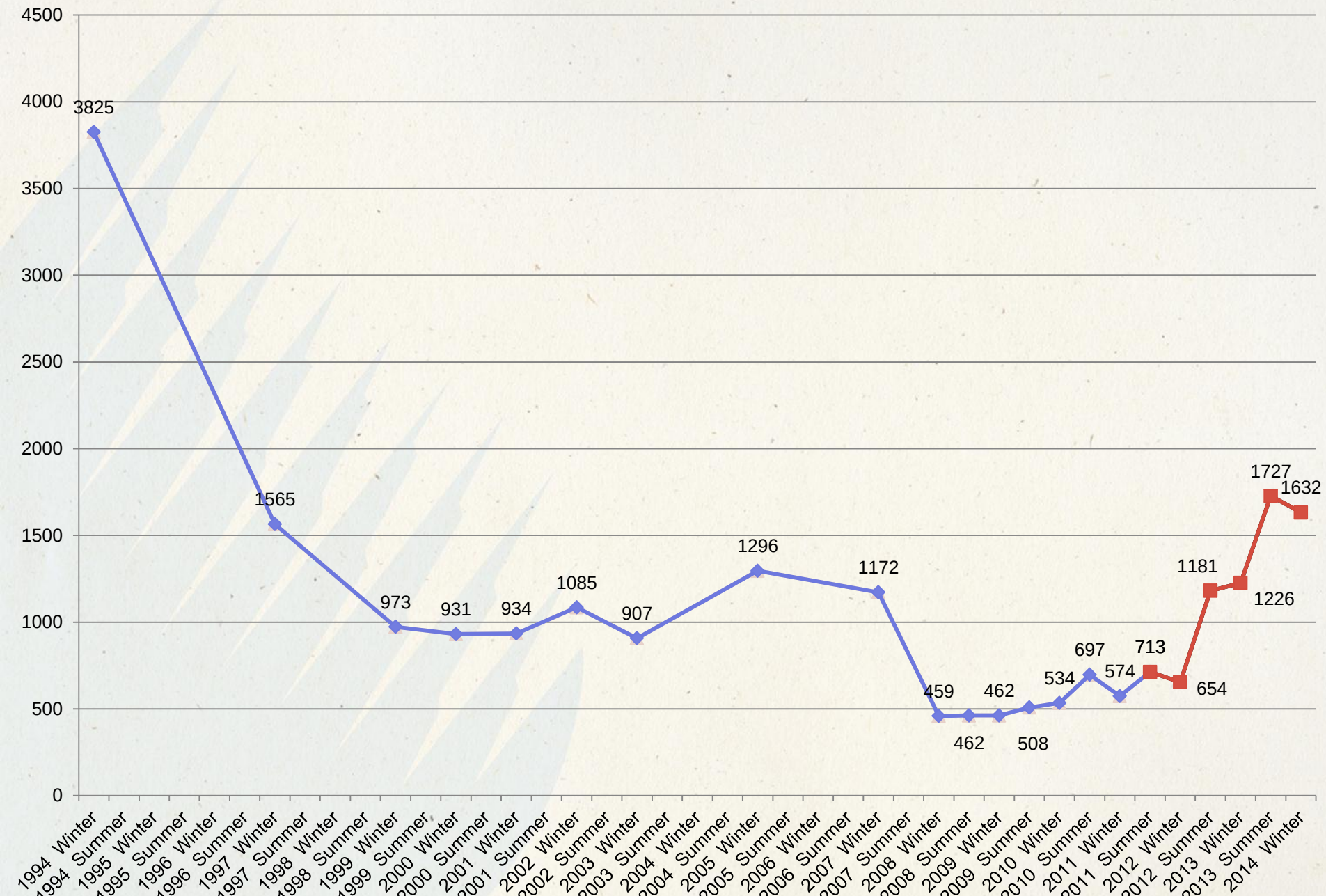


Warm Springs Natural Area

- February 2014 snorkel count found 1632 Moapa dace.
- Moapa dace essentially limited to three of five major springs.
- Moapa Valley National Wildlife Refuge began land and water purchases in 1979.
- Refuge protects three major springs and their outflow streams.
- In 1998, USFWS personnel constructed a fish barrier on adjacent ranch land to prevent blue tilapia from entering the Refuge.
- All Moapa dace still occur in this area.



Moapa Dace Numbers 1994-2014



Moapa Dace Restoration Efforts on WSNA

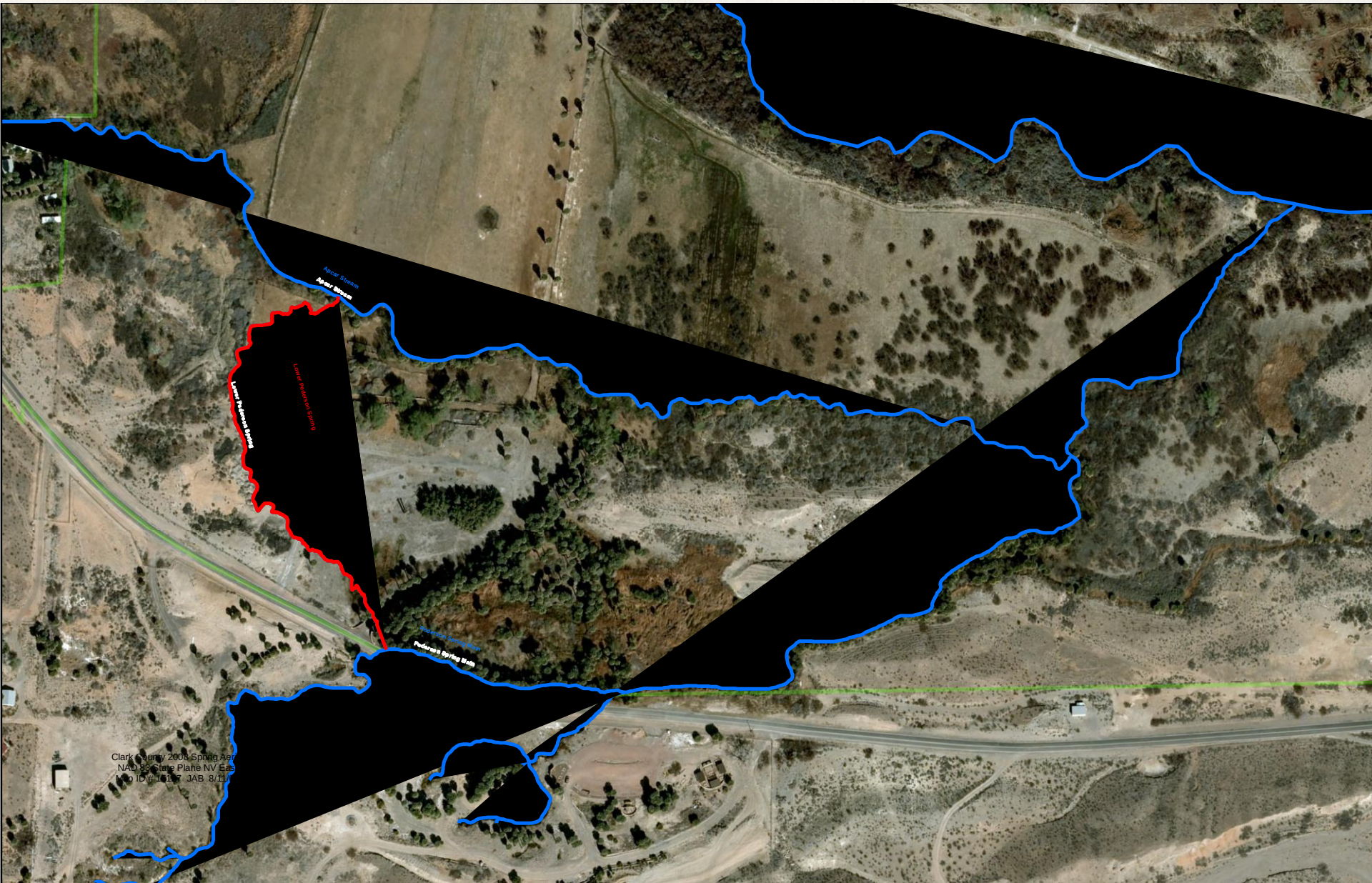
- Stream Restoration
  - Pederson Stream (2008)
  - Apcar Stream (2011-2012)

- Invasive Species Control
  - Tilapia
  - Palms
  - *Vallisneria*
- Impending Threats
  - Red shiner (*Cyprinella lutrensis*)
  - Red-swamp crayfish (*Procambarus clarkii*)

Lower Pederson Project (2008)

- Pederson Stream had been diverted for irrigation
- Dense palms growing in the channel caused sheet flow and cooling
- New channel constructed towards the historic location

Lower Pederson Project (2008)
Biological Advisory Committee recommended
SNWA funded



Lower Pederson Project (2008)

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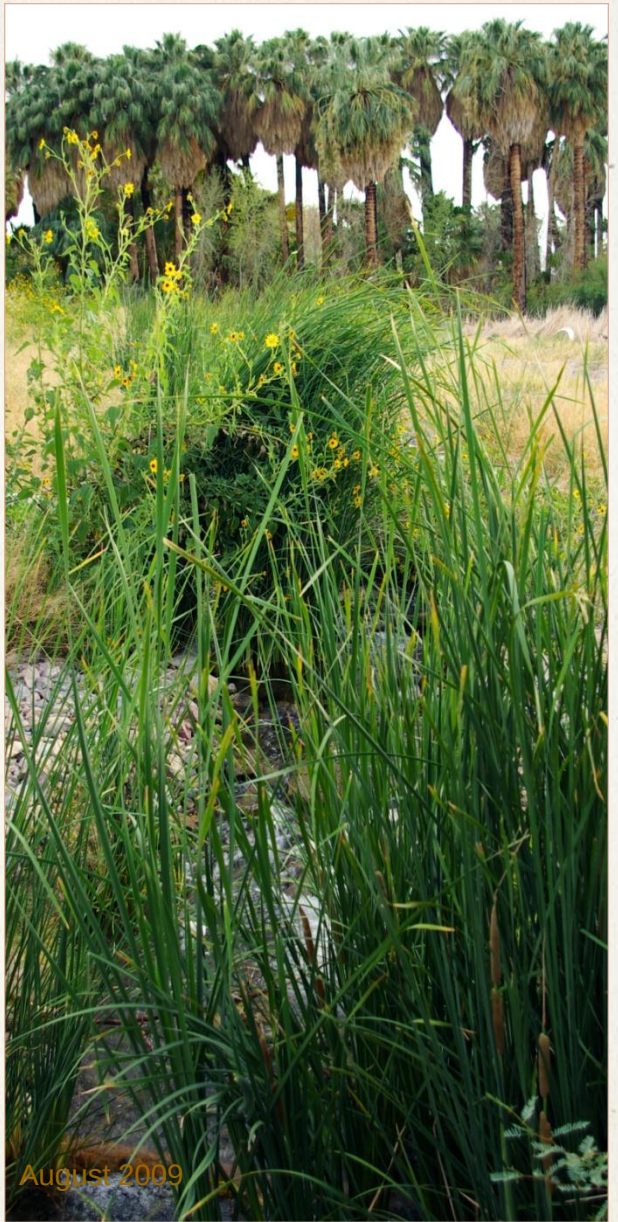
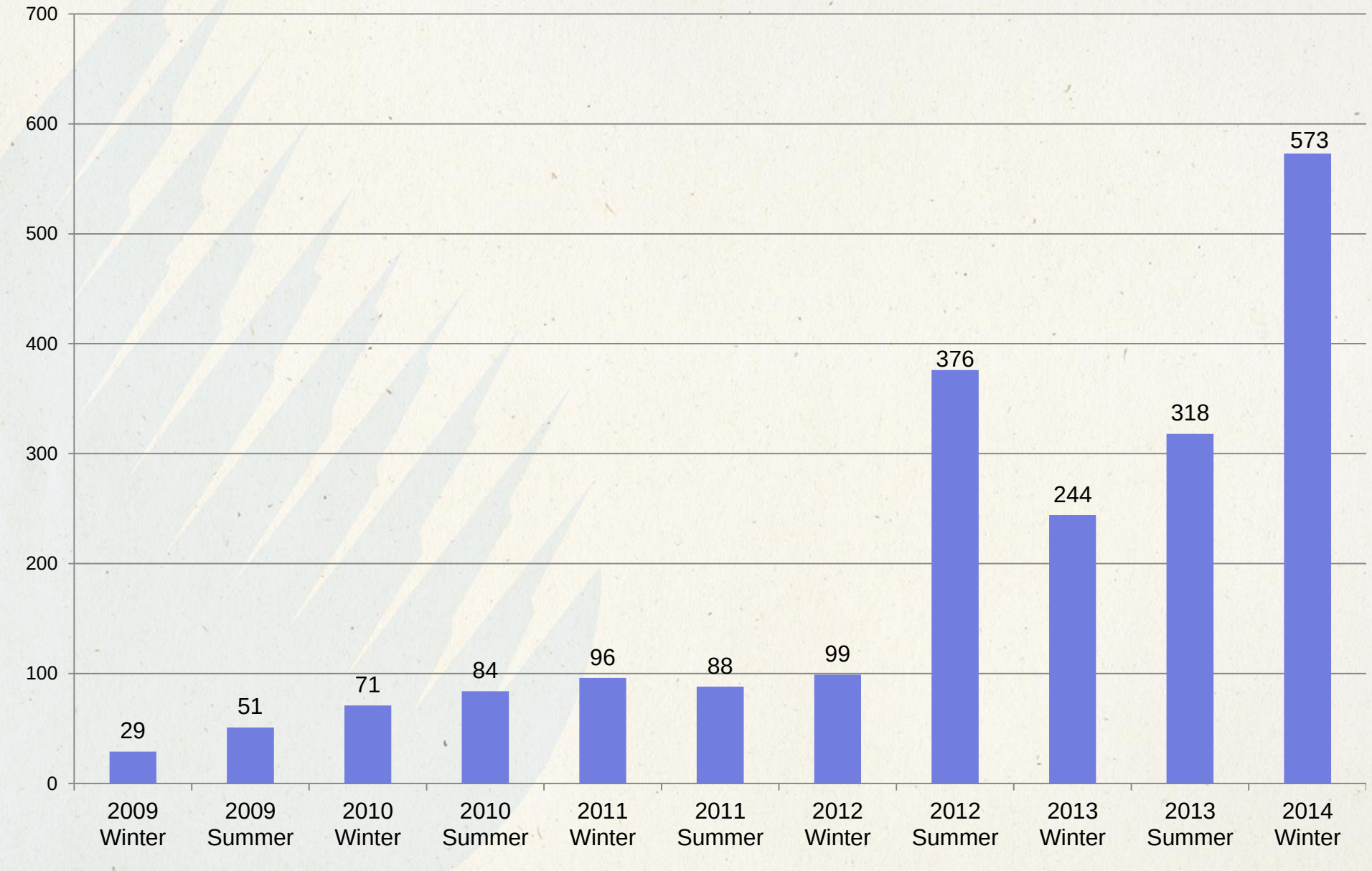
Lower Pederson Project

11/2008 6/2009 8/2009



Moapa Dace Numbers Lower Pederson Stream 2008-2014



Apcar Restoration 2011-2012

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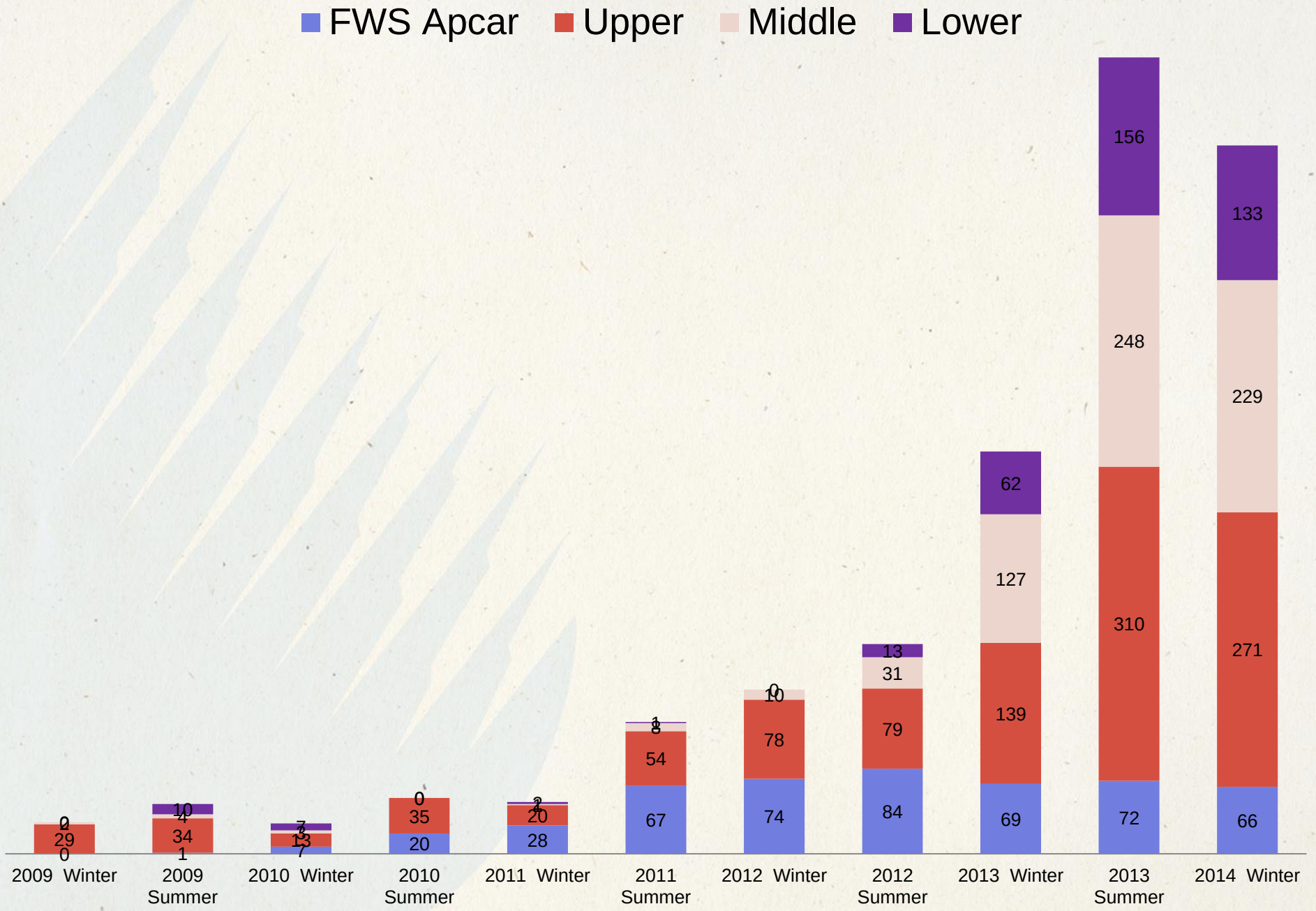
Apcar Culvert Replacement Allows Fish Passage (2013)

Moapa Dace Numbers Apcar Stream 2008-2014

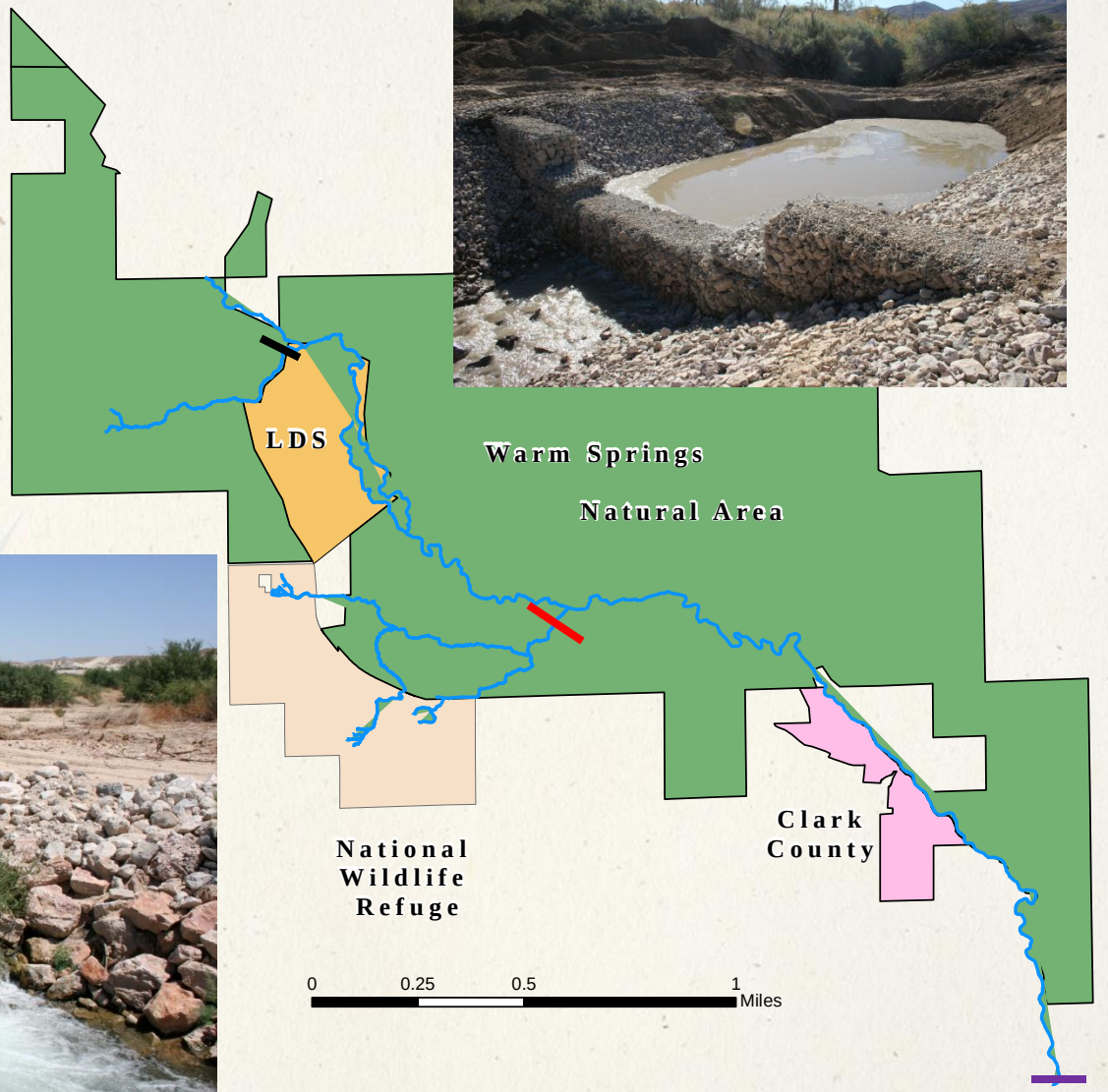


Fish Barriers and Tilapia Control Efforts

— 1998 Gabion Fish Barrier installed on Refuge Stream

— 2007 BLM Fish Barrier installed as a downstream anchor to prevent fish from entering the area

— 2008 South Fork Fish Barrier installed to facilitate tilapia removal on the South Fork



NDOW 4 Rotenone Treatments October/November 2011

Planned Fish Barriers and Tilapia Control Efforts

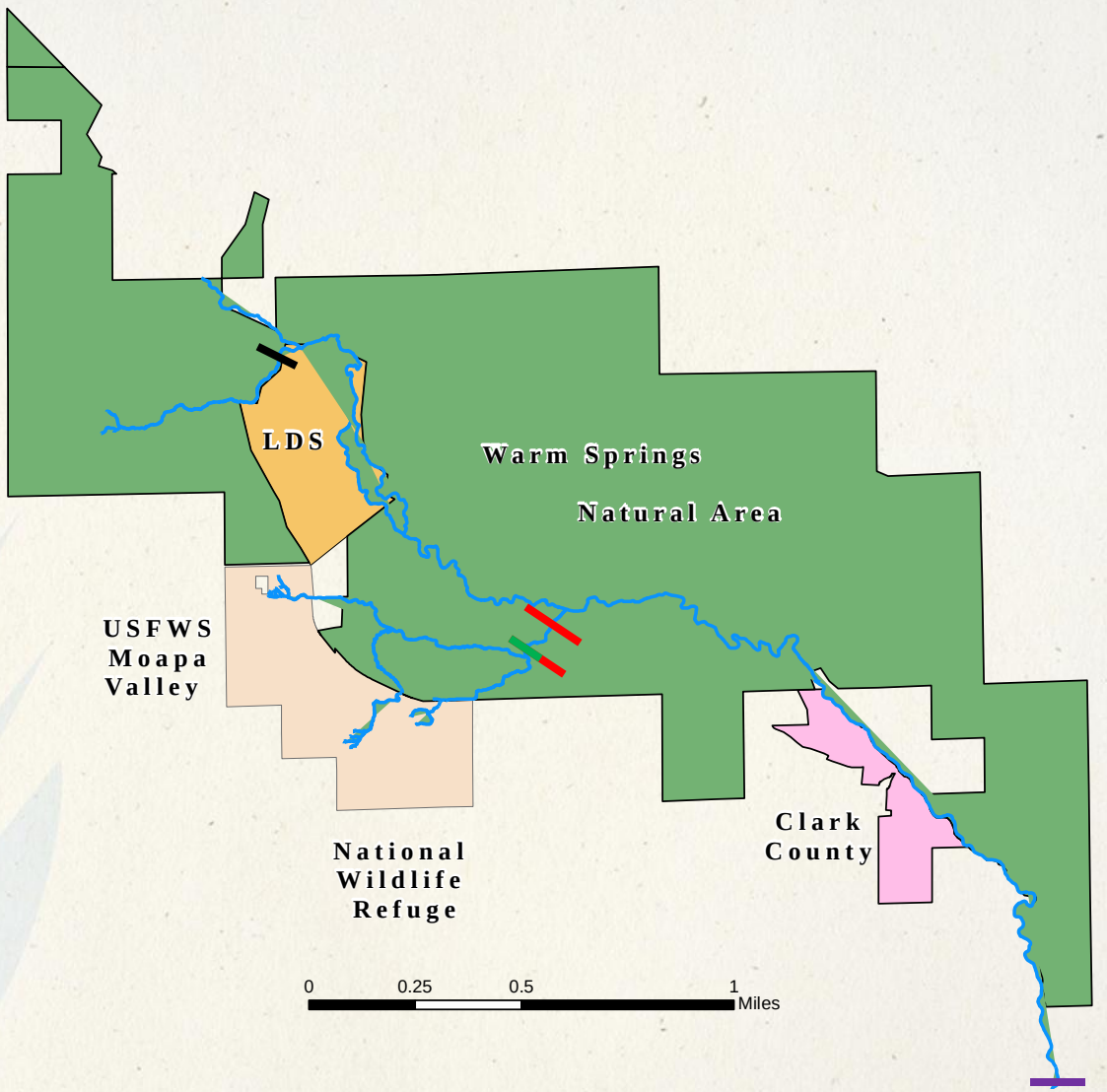
— Remove existing South Fork fish barrier

— Remove existing Refuge Stream fish barrier

— Install Refuge Stream removable fish barrier

— Open Refuge Stream fish barrier

— Retrofit BLM Barrier to resist crayfish



Next Steps for Biological Advisory Committee

- Continue efforts to remove tilapia and other invasive species
  - Once tilapia are eliminated, remove fish barriers to restore connectivity
  - Install removable barriers that can be inserted if other invasive fish are found

Next Steps

- Continue monitoring Moapa dace population
- Work cooperatively to manage water in the Muddy River
- Finalize Muddy River Recovery Implementation Program which will address other species on the Muddy River
- Provide limited Public Access to Warm Springs Natural Area

Muddy River Recovery Implementation Program

USFWS
SNWA
Moapa Valley Water District
Coyote Springs Investment
Moapa Band of Paiutes

Biological Advisory Committee

Nevada Department of Wildlife
US Fish and Wildlife Service
US Geological Survey
Coyote Springs Investment
Moapa Band of Paiutes
NV Energy
Clark County
The Nature Conservancy